AUTOMATIC MANAGEMENT SYSTEM FOR PAY CAR PARKS, OR THE LIKE

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Cited documents:

WO9301567
FR2566942
WO9638819
EP0287250
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Abstract of **WO9930290**

A system for managing particularly pay car parks comprises: a) a first local network for detecting the individual presence of a vehicle for each car space, for signalling the car space status and for providing an individual user interface for each car space to transmit and receive communications concerning the car park and to manage the parking time and fee calculation modes; b) a second centralized network for managing the individual local networks to perform automatic debiting procedures and control procedures; c) the local network(s) being interfaced with the central network.

AUTOMATIC MANAGEMENT SYSTEM FOR PAY CAR PARKS, OR THE LIKE

Description of **WO9930290**

BARTOLOMEO MONGIARDINO
Automatic management system for pay car parks, or the like
The invention relates to a system for managing particularly pay car parks.

Currently, especially parking times of vehicles are managed by means of systems which traditionally derive from mechanical parking-meters or from indoor car-park management with employed personnel.

Current systems have the drawback that they cannot control continuously the vehicle presence in the car park and the correspondence between the vehicle parking time and the payment of fees. Due to this drawback, car park regulations are rather inelastic, in order to limit losses due to undetectable unauthorized parking.

Moreover, parking areas are forcibly lowly exploited, with respect to time/toll collection efficiency. From a practical point of view, currently used systems often force the user to look for a guardian, who is not always there, or to have money denominations fit for payment with automatic means. Magnetic cards means are also known, wherewith a ticket to be exposed in the vehicle may be paid. However, payment cards are different from town to town and are difficult to find, so they cannot be widely used.

This problem gets much more critical when the user is not from that town and ignores the traditional car park usage procedures, and the expedients required to get the parking permission or to pay for parking.

The invention has the object to provide a system for managing particularly car parks wherewith the drawbacks of known systems may be obviated, and which requires very low management costs, apart from installation costs, while providing the highest efficiency in using car park occupancy time as regards the economic return thereon.

The invention achieves the above objects by providing a system of the type described hereinbefore, comprising:
A first local network for detecting the individual presence of a vehicle for each car space, for signalling the car space status, and for providing an individual user interface for each car space, to transmit and receive communications concerning the car park and to manage the parking time and fee calculation modes;
a second centralised network for managing the individual local networks to perform automatic debiting procedures and control procedures.

The local network/s being interfaced with the central network.

The local network also advantageously has means for identifying unauthorised users.

The local network has means for identifying the presence of a vehicle on the parking area. These means may be of any type, either optoelectronic, or with radio-frequency sensors, or the like.

Further, the local network has means for signalling the parking area status both as regards its availability, and as regards the parking payment condition of the user.

Advantageously, said signalling means are of the universally comprehensible type, and particularly consist of a traffic light, with the usual green, red and amber signalling colours.

The local network may also have means for detecting and identifying the particulars of the parked vehicle, for example photographic means, or similar, which come to operation when someone attempts to leave without paying or accomplishing due payment transactions.

The local network has local means for communicating with the individual users, wherein the parking areas and the identification parameters thereof are stored. The local communication means may be of several types and have various functions.

Said means may alternatively or combinedly comprise vocal communication means, message displaying

means, as well as vocal or mechanical data entering means. All system/user communication means may use multilingual functions, with language selection options, and include pre-recorded or synthesized vocal messages and alphanumeric and numeric pre-recorded or preset messages. The means whereby users may enter data consist of microphones, keyboards, cursors or possibly even touch-control displays, the so-called touchscreens.

The local means for communicating with the users are advantageously provided, alternatively or combinedly, with readers of magnetic or microprocessor payment cards, credit cards, or similar and payment means like money.

In a preferred embodiment, the central network consists of an existing network, such as a telephone network, a toll motorway network or a bank transaction management network, such as an ATM network, or similar, the local network, and particularly the means for communicating with the users being interfaced with said network.

When the central network is a telephone network, the functions of the local communication means may be limited to the control and management of the means for detecting and controlling the parking status and of the means for identifying defaulting or unauthorized users.

In addition, in these conditions, said local communication means may form communication central units between portable phones and the telephone network, in order to avoid coverage problems.

Obviously, the communication means may have, alternatively or combinedly, all the functions described herein, to provide users with the highest number of payment options.

Local networks may have, alternatively or combinedly, totally automatic means for detecting the user, for performing payment transactions and for other functions, by using systems of the automatic payment type, such as those used in motorways and known in
Italy as Telepass. In this case, the means for detecting the user comprise transceiver units which communicate with receiving and transmitting units mounted on the vehicle of each user.

The above disclosure clearly shows the advantages of the present invention. The management system according to the teaching of the invention is inexpensive and reduces management costs. As regards the central network for managing local networks existing networks may be used, already provided with the functions suitable for performing payment transactions. According to the type of local network, the latter may also use existing networks, thereby limiting economic efforts to the single installation of detection and identification sensors, to the car park status indicators and to the local unit wherein one or more functions may be implemented, also alternatively.

The functions of local units may be also broadened in time, by advantageously providing them with an appropriate modular structure, upon design thereof.

The structure of the system according to the invention is very elastic as regards operational modes and interfacing with the user and allows to change 10% of the car park usage time into profit, by ensuring higher earnings than traditional systems. The increase of earnings per unit of car park availability time is such that the margin of gain may be high even when the parking costs per unit of time are lowered.

The flexibility of the system allows to assist non-resident users and to change almost all parking areas from free areas into pay areas, in high traffic zones. Moreover, differentiated fees may be provided for zones having different traffic densities, while making the latter compatible with the market law of demand and supply.

In this type of systems, management passes with the highest simplicity and clearness from improvised managers to specialists in this type of systems. This certainly contributes to increase productivity.

As regards taxation, the car park users may receive an inclusive invoice on a monthly basis, or similar, whereby when car parks are used for work reasons, the user may effectively deduct expenses, which may also reach considerable sums, undetermined until present.

The invention also relates to further improvements, which form the subject of the dependent claims.

The characteristics of the invention will appear more clearly from the following description of a nonlimiting

application example, illustrated in the accompanying drawings, in which:
Fig. 1 is a schematic view of a block diagram of the system.

Fig. 2 shows an example of the means for signalling the car park status, for detecting users and for identifying users.

Fig. 3 shows an example of a local communication unit.

Figs. 4 to 7 show different operational options of the system, in the form of block diagrams.

Referring to figures, a system according to the invention comprises, for each car park 1, a sensor 2 for detecting the presence of a motor vehicle, means 3 for signalling the car park status, means 4 for identifying the parked motor vehicle.

The sensor 2, the signallers 3, and the identifying means 4 of each car park 1 are connected to a local unit 5, provided with a communication network and are controlled thereby. Each car space is designated by an identification mark, indicated on a sign 7.

The local unit 5 placed in a location next to the car park is connected via ether or by means of communication lines to a unit or a central network for managing one or more parking areas.

This system structure may comprise several types of sensors 2, signallers 3, identifying means 4, local units 5 and central management networks 6.

The sensor 2 for detecting the presence of a motor vehicle may consist, for example, of an electromagnetic wave transmitter and receiver, with the variation of an electromagnetic wave reflected against the vehicle being detected thereby. Alternatively, the signaller may consist of an inductance detector, which detects the inductance change produced by the metal mass of the vehicle. A camera, associated to an image processing unit may be also used. Optical or optoelectronic sensors for detecting the electromagnetic waves emitted by the vehicle, particularly a vehicle inboard transceiver, for example of the type used in motorway automatic Payment barriers, known in Italy as Telepass.

Obviously, each car park may be associated to a combination of different types of detecting sensors, for example sensors involving a passive function of the vehicle and sensors of the Telepass type, or similar.

According to one embodiment, the presence sensors 2 and/or the identifying means 4 may be also embedded in the ground or pavement of the car park. In this case, they are placed in preferably water-tight cases, which may be also covered with a protecting layer, such as blanket or have a walkable cover, like a manholecover or the like.

The signalling means may be also of any type.

Preferably, for an easier comprehension of signals, they consist of traffic lights, as shown in fig. 2.

The signallers have the function to detect both the car space status, for example free or reserved, and the toll payment situation of the user, i.e., for example, insufficient payment for parking period spent, or parking period expired.

The user identifying means may be combined with the sensors, such as in the case of the camera or of the operating occupancy signalling device with a vehicle inboard transmitting unit. Here, the inboard transmitter is questioned and transmits data regarding the presence and identification of the vehicle or of the user.

The local unit 5 comprises message displaying means 105, such as a screen or similar or, combinedly or alternatively, sound announcing means 305, means 205 whereby the user may enter data or communications, such as a keyboard, a push-button strip, or other similar means, and/or vocal means for entering commands, such as a microphone and automatic payment means 405. The latter may be, alternatively or combinedly, electromechanical money payment means, and readers/writers of magnetic or microprocessor cards, either in the form of credit cards or in the form of prepaid stored value cards, or in the form of reloadable stored value cards.

Possibly, the local unit may have messages stored in different languages, which may be selected by the

user before starting the parking toll payment procedures.

The centralized network 6 may be of any type, either a dedicated specially built network, or an existing network, which may be used by local networks.

To this end, telecommunication networks, bank networks for electronic transactions and other alternative existing networks may be used.

The methods wherewith the system and the structure are managed, for example by local networks, and by centralized networks depend on different options, each having specific advantages. A system of this type may be organized in such a way that local networks, i.e. local units may be interfaced with several central networks, thus allowing the use of different payment options.

Tables 4 to 7 show flow charts of different types of systems, operating with different specific means and using different central networks.

The general structure involves a substantially identical procedure. The user should tell the local unit the identification mark of the occupied car space, the time of arrival and the estimated time of departure and, according to the latter, he should pay the indicated sum. The central unit checks the consistency of the time data entered and give the green light, allowing to park the vehicle. If the departure time is not respected, when the paid parking period expires, the red light switches on. Then, the user shall integrate the parking payment. The central unit checks the consistency of the received sum and, if this is correct, gives the green light again.

If the user ignores the red light and leaves the car space without authorization, the identification system stores the identification particulars of the user and connects them to the unsuccessful transaction.

The system may account for different time periods, involving different parking/min. costs, possibly in progression, according to the parking time. By an internal clock, the local unit checks the current time rate period and the total parking time and computes the parking cost.

In this way, rates may be associated to the actual parking demand. In peak hours, the cost per minute may also be higher than in other hours of the day. In these peak time periods, the progression of cost increase with the parking time may be faster than in other time periods, wherein the progression may be cancelled or even reversed, in order to obtain a better distribution of traffic by reducing the peak charge. The expiration of the estimated and paid parking period may be subject to an increased cost, as a penalty. Different expiration periods may be also provided whereto different cost increases are associated. In combination with a payment transaction system providing an inboard transmitter, the local unit itself can automatically communicate with the inboard unit, controlling, within the appropriate cost options, and at predetermined time intervals, the payment transaction for the additional fee related to the period after the initially presumed departure time. This may occur, for example at ten or five minutes intervals.

The high elasticity of the system allows to provide all possible methods and options without intervention on the system itself. Rates changing with seasons or periods of the year may be also foreseen.

All rates and computing programs, as well as programs for controlling payment, sensor, signalling and identifying means are stored in the local unit. The local unit may in turn be controlled by the central unit with respect to its functional integrity. The centralized network may be also used to update rates, to compute payments and to perform communication and payment procedures at the user level.

The different system options of figures 4 to 7, assume the use of a local unit in the form of a phone, for example of the same type as current card-operated public phones, or the use of a local unit capable to communicate with a cellular phone.

Table 4 shows the payment steps that the user must follow, when he occupies the car space, with a prepaid stored value card, or with a bank account debit card, or by using the communication system associated to the local unit, or with a cellular phone.

The instructions for the user appear in boxes 10, 11, 12, whereas box 13 indicates the different time rates and their variations in the different hours of the day.

The user instructions provide the different steps, listed in frame 10: lift up the receiver, insert the card,

enter the number of the car space and the estimated departure time and confirm. Possibly, written instructions may be accompanied by vocal instructions.

Also, there may be provided the further preventive step of selecting the communication language, as currently used in public phones.

The local unit performs a correctness analysis of the entered data and, if the departure time precedes the arrival time, then it asks for a new entry, otherwise, it completes the procedure and switches the traffic light of the corresponding space from red to green.

A number to be dialled is indicated for using a cellular phone. The car park management service will transmit a sequence of vocal communications which will help the user to set the necessary data substantially according to the previous procedure with the normal phone of the local unit. In this case, the fee may be debited either on the prepaid card associated to the phone, or on a bill, the car park management being allowed to use one of telephone lines designed to provide private telephone services.

Through a cellular phone, the local network is able to automatically detect the arrival time, and to compute and debit the actual parking costs directly, with no user intervention.

At the departure time, in all cases provided herein, three different conditions may occur, depending on the fact that the actual parking period is longer than the pre-set period, or that an extension of the parking time is required before the expiration of the pre-set period. When the traffic light is red, it indicates the expiration of the maximum parking period paid for at the arrival, and the entry in the zone wherein a penalty is paid for the additional parking period.

In the case of table 5, these possibilities and the procedures associated thereto are shown with reference to a prepaid stored value card.

The user repeats the payment steps as indicated.

If the traffic light is red, the card is analyzed with respect to its balance, and hence the local unit deducts the further parking fee therefrom. Then, it indicates that the user has paid an additional fee, with penalty, for having exceeded the expiration of the estimated parking period, it returns the card and switches the traffic light from red to green. At this moment, the user may set a new departure time and in this case, the local unit also deducts from the card the cost for the additional parking period from that moment, and this time at the normal penalty-free rate, said penalty being paid only for the period from the end of the estimated parking time to the moment of the parking renewal.

If the stored value card has a sufficient amount for paying the penalty, but not sufficient for paying the additional required parking period, the local unit switches the traffic light to green, while indicating that the card is empty and that an amount has been paid for a parking period ending at a predetermined time, not before the required one.

When the prepaid card is not even sufficient to pay the accumulated penalty, the local unit notifies the user this situation, asking him to insert a new card.

The intermediate column shows the case wherein the traffic light is amber. This may coincide with the expiration of a preset parking period within a certain additional time period allowed before the penalty is applied, or even when the paid parking period has expired, but no penalty is anyway debited on the basic rate. In this case, the local unit tells the user that the parking period has been exceeded and debits the cost of the additional parking period.

In this option also, the additional parking time setting may occur to involve higher costs than allowed by the card balance. Then, the local unit warns the user about this situation and indicates the allowed parking period, which has been paid for according to the card balance, switching the traffic light from amber to green.

If the user reaches the vehicle while the traffic light is green and wants to extend his parking period, the local unit debits the cost of the additional parking period, telling the user that the parking period has been extended until the requested time.

If the balance on the card is insufficient, the local units sends a message like the one described

hereinbefore, with reference to the amber light condition.

The use of a bank account card is shown in table 6. In this case, the procedure is lighter, no check nor card balance signalling being required.

The beginning of the procedures is substantially as previously described, the only substantial difference introduced with a bank account debit card being that the departure time may be free, since the card itself has theoretically no debit limits. In this case, when the departure time is indicated, a predetermined code is set. The local unit signals that the computed amount will be debited according to the total parking period. This may be automatically determined at the departure moment or the user shall inform the local unit thereof. Upon user confirmation, the traffic light is switched to green, enabling the user to park the vehicle, otherwise, after a short period, the user is asked to repeat the procedure.

If the user indicates a precise departure time, the three options illustrated hereinbefore with respect to the stored value card may occur, i.e. departure without additional extension of the parking period, or extension of the parking period required after the indicated departure time, within a leniency interval or before the expiration of the indicated departure time.

Conversely to the above description regarding the stored value card, whereon an exact and finite number of credits are stored, as indicated hereinbefore, the bank account debit card does not require to check if there is a sufficient balance to cover the additional fees. The procedure is as previously described with reference to table 5, except for the options in case of insufficient credit to cover additional fees.

Table 7 shows the procedure when a cellular phone is used. In this example, the amount is debited on a telephone bill, for example as with services provided by private organizations or with pay services supplied by the telecommunication network manager.

When the cellular phone is used, the local unit only gives the user the number corresponding to the car park management service. The operations and options are like those indicated for the bank account card, the only difference consisting in that communications take place through the cellular phone.

An option may be also provided which is like that of the stored value card, but using the cellular phone.

This allows the communication between the manager and the user, when the latter is provided with a card-type cellular phone.

Naturally, the options indicated herein are mere examples. These may be implemented separately or combinedly, providing a broad range of different parking toll payment options. Certain options may be favoured by discounts or else, for example if they particularly please the manager, whereas others may be discouraged.

The above disclosure clearly shows the high flexibility of the system according to the invention.

The double-network structure, i.e. comprising one or more local networks associated to the car parks, with one or more management centralized networks allows an easy adaptation of the individual interfacing and debiting means, as well as of the signalling means, of the sensors for detecting the vehicle presence and of the means for identifying the user, without affecting parts involving a complex and expensive replacement.

Naturally, the invention is not intended to be limited to the embodiments illustrated and described hereinbefore, but may be greatly varied without departure from the guiding principle disclosed above and claimed below.

AUTOMATIC MANAGEMENT SYSTEM FOR PAY CAR PARKS, OR THE LIKE

Claims of **WO9930290**

CLAIMS

1. A system for managing particularly pay car parks, characterized in that it comprises:
a) A first local network for detecting the individual presence of a vehicle for each car space, for signalling the car space status and for providing an individual user interface for each car space to transmit and receive communications concerning the car park and to manage the parking time and fee calculation modes;
b) a second centralized network for managing the individual local networks to perform automatic debiting procedures and control procedures.
c) the local network/s being interfaced with the central network.

2. A system as claimed in claim 1, characterized in that the local network also advantageously has means for identifying unauthorised users.

3. A system as claimed in claim 1 or2 characterized in that the local network has means for identifying the presence of a vehicle on the parking area. These means may be of any type, either optoelectronic, or with radio-frequency sensors, or the like.

4 A system as claimed in one or more of the preceding claims, characterized in that the local network has means for signalling the parking area status both as regards its availability, and as regards the parking payment condition of the user.

A A system as claimed in one or more of the preceding claims, characterized in that said signalling means are of the universally comprehensible type, and particularly consist of a traffic light, with the usual green, red and amber signalling colours, whereto the available or paid parking status, the unuthorized or unpaid parking status, and the parking status out of the paid period, but in the leniency period condition are respectively associated.

6. A system as claimed in one or more of the preceding claims, characterized in that the local network may also have means for detecting and identifying the particulars of the parked vehicle, for example photographic means, or similar, which come to operation when someone attempts to leave without paying or accomplishing due payment transactions.

7. A system as claimed in one or more of the preceding claims, characterized in that the local network has local means for communicating with the individual users, wherein the parking areas and the identification parameters thereof, as well as the programs for managing and controlling signalling means, sensors, identifying means, debiting means and the programs for controlling and managing the parking time and rate communication, debiting and computing procedures are stored.

8. A system as claimed in one or more of the preceding claims, characterized in that means for communicating with the users may alternatively or combinedly comprise vocal communication means, message displaying means, as well as vocal or mechanical data entering means.

9. A system as claimed in one or more of the preceding claims, characterized in that all system/user communication means are provided with multilingual functions, with language selection options, and include pre-recorded or synthesized vocal messages and alphanumeric and numeric pre-recorded or preset messages.

10. A system as claimed in one or more of the preceding claims, characterized in that the means whereby users may enter data consist of microphones, keyboards, cursors or possibly even touch-control displays, the so-called touch-screens.

11. A system as claimed in one or more of the preceding claims, characterized in that the local means for communicating with the users are provided, alternatively or combinedly, with readers of magnetic or microprocessor payment cards, credit cards, or similar and payment means like money.

12. A system as claimed in one or more of the preceding claims, characterized in that the central network

consists of an existing network, such as a telephone network, a toll motorway network or a bank transaction management network, such as an ATM network, or similar, the local network, and particularly the means for communicating with the users being interfaced with said network.

13. A system as claimed in one or more of the preceding claims, characterized in that the central network is a telephone network, and the local communication means are limited to the function of controlling and managing the means for detecting and controlling the parking status and the means for identifying defaulting or unauthorized users, whereas the communication means may consist of a phone or a cellular phone.

14. A system as claimed in one or more of the preceding claims, characterized in that the communication means may have, alternatively or combinedly, wholly or partly, all the payment functions as claimed in the preceding claims.

15. A system as claimed in one or more of the preceding claims, characterized in that local networks may have, alternatively or combinedly, totally automatic means for detecting the user, for performing payment transactions and for other functions, by using systems of the automatic payment type, such as those used in motorways and known in Italy as Telepass, the means for detecting the user comprising transceiver units which communicate with receiving and transmitting units mounted on the vehicle of each user.

16. A system as claimed in one or more of the preceding claims, characterized in that the presence sensors (2) and/or the identifying means (4) are embedded in the ground or pavement of the car park.

17. A system as claimed in claim 16, characterized in that the presence sensors (2) and/or the identifying means (4) are placed in preferably water-tight cases, which may be also covered with a protecting layer, such as blanket or have a walkable cover, like a manhole cover or the like.

18. An automatic management system for pay car parks, or the like, wholly or partly as described, illustrated and for the purposes stated herein.

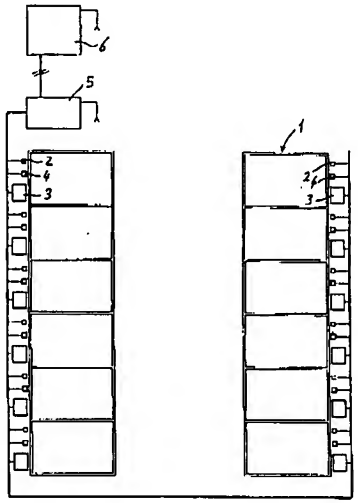

Fig. 1

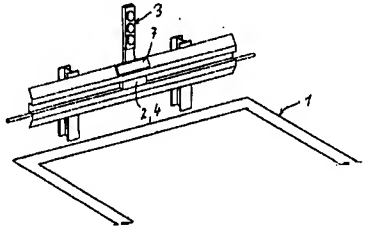

Fig. 2

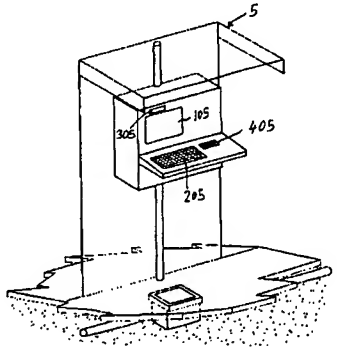

Fig. 3

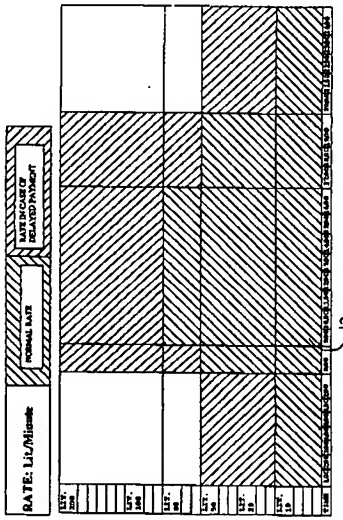

Fig 4A

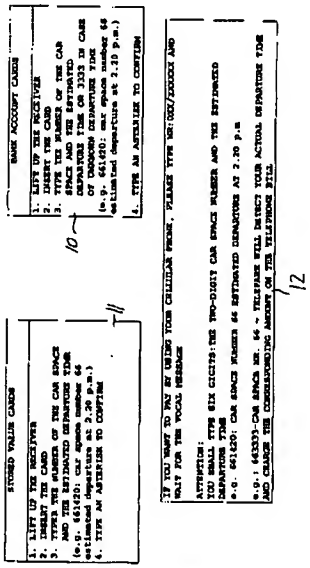

Fig 4B

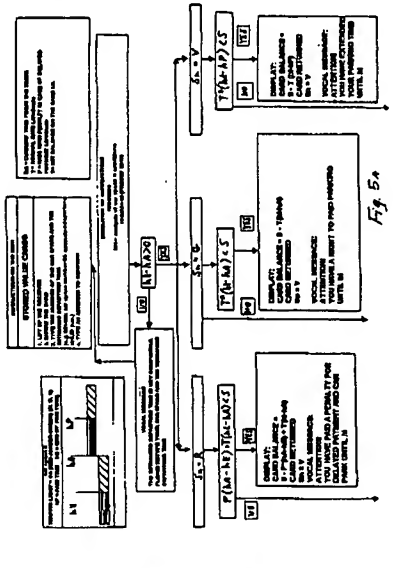

Fig 5A

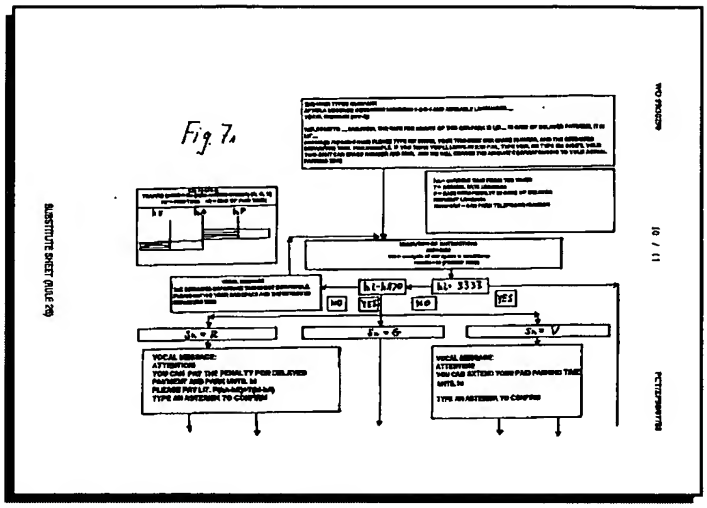

Fig. 7A

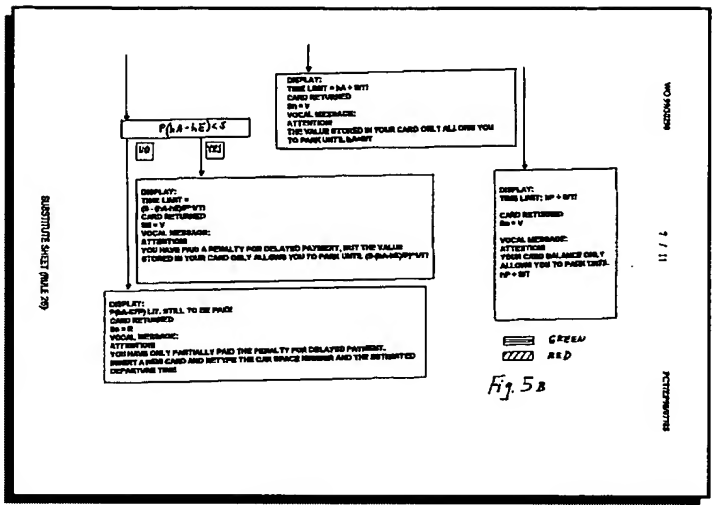

Fig. 5B

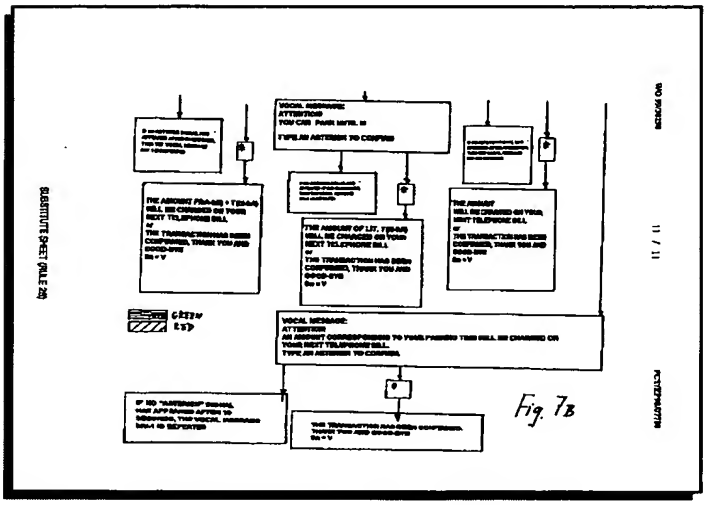

Fig. 7B

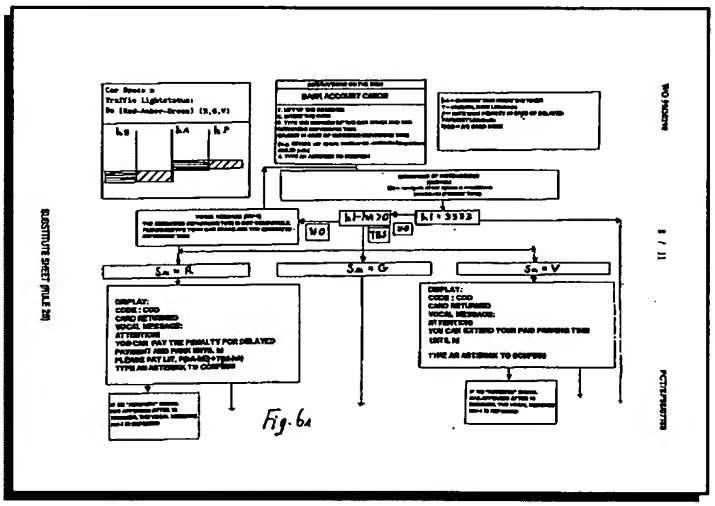

Fig. 6A

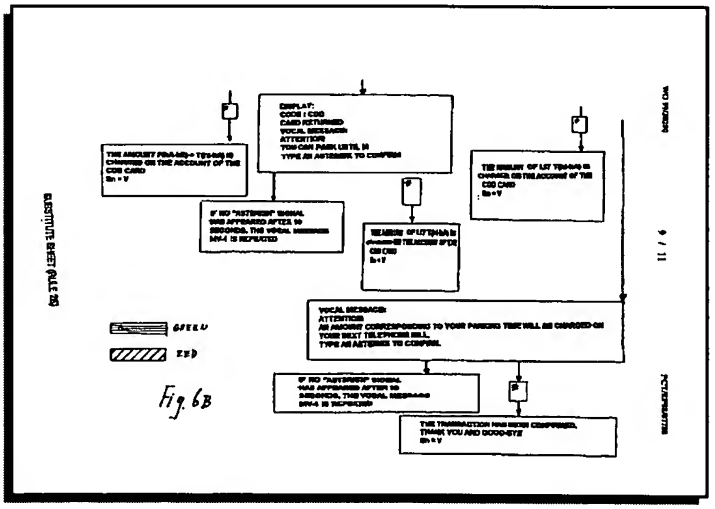

Fig. 6B